

CLAIMS

1. A process for forming a coating on a substrate, including the steps of:
5 establishing a fluidised-bed of a powder coating composition, thereby effecting tribostatic charging of the powder coating composition, the fluidised-bed including a fluidising chamber at least a part of which is conductive,
applying a voltage to the conductive part of the fluidising chamber,
10 immersing a substrate which is either electrically non-conductive or poorly conductive wholly or partly in the fluidised bed, whereby tribostatically charged particles of the powder coating composition adhere to the substrate, the substrate being either electrically isolated or earthed,
15 withdrawing the substrate from the fluidised-bed and forming the adherent particles into a continuous coating over at least part of the substrate,
the process being conducted without ionisation or corona effects in the fluidised bed.
- 20 2. A process as claimed in claim 1, wherein the substrate comprises a medium density fibreboard (MDF).
3. A process as claimed in claim 1 or claim 2, wherein the substrate comprises wood.
- 25 4. A process as claimed in claim 1 or claim 2, wherein the substrate comprises a wood product.
5. A process as claimed in claim 1, wherein the substrate comprises a plastics
30 material.

6. A process as claimed in claim 1 or claim 5, wherein the substrate comprises a plastics material including an electrically conductive additive.
- 5 7. A process as claimed in claim 6, wherein the plastics material comprises polyamide.
8. A process as claimed in claim 1 or claim 5, wherein the substrate comprises a highly insulating plastics material.
- 10 9. A process as claimed in claim 8, wherein the plastics material comprises polycarbonate.
- 15 10. A process as claimed in any one of claims 1 to 4, wherein the surface resistance of the substrate is of the order of at least 10^3 ohms/square.
11. A process as claimed in any one of claims 1 to 4 or claim 10, wherein the surface resistance of the substrate is of the order of from 10^3 to 10^5 ohms/square.
- 20 12. A process as claimed in any one of claims 1 to 4 or claim 10, wherein the surface resistance of the substrate is of the order of at least 10^5 ohms/square.
- 25 13. A process as claimed in any one of claims 1, 5 or 6, wherein the surface resistance of the substrate is of the order of from 10^5 to 10^{11} ohms/square.
14. A process as claimed in any one of claims 1 or 7 to 9, wherein the surface resistance of the substrate is of the order of at least 10^{11} ohms/square.

15. A process as claimed in any one of claims 1, 5 to 9, 13 or 14, including the step of heating the plastics material to a temperature below its melting point and below the transition point of the powder coating composition before immersing the substrate in the fluidised bed.
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16. A process as claimed in claim 8 or claim 9, including the step of pre-charging the substrate before immersing it in the fluidised bed.
17. A process as claimed in claim 16, including the step of equalising the charge on the substrate before immersing the substrate in the fluidised bed.
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18. A process as claimed in claim 17, including the step of heating the substrate to a temperature below its melting point in order to equalise the charge.
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19. A process as claimed in claim 17 or claim 18, including the step of moistening the surface of the substrate in order to equalise the charge.
- 20.
20. A process as claimed in any one of claims 1 to 4, wherein there is no preheating of the substrate prior to immersion in the fluidised bed.
- 20
21. A process as claimed in any one of claims 1 to 20, wherein a dc voltage is applied.
22. A process as claimed in claim 21, wherein a positive dc voltage is applied.
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23. A process as claimed in claim 21, wherein a negative dc voltage is applied.

24. A process as claimed in any one of claims 1 to 23, wherein such a voltage is applied that the maximum potential gradient existing in the fluidised bed is 29 kV/cm, 27.5, 25, 20, 15, 10, 5, 1 or 0.05 kV/cm.
- 5 25. A process as claimed in any one of claims 1 to 24, wherein such a voltage is applied that the potential gradient existing in the fluidised bed is at least 0.1 kV/cm or at least 0.5 kV/cm.
- 10 26. A process as claimed in any one of claims 1 to 25, wherein such a voltage is applied that the potential gradient existing in the fluidised bed is at least 0.01 kV/cm or at least 0.05 kV/cm.
- 15 27. A process as claimed in any one of claims 1 to 26, wherein a voltage in the range of from 10V to 100kV is applied.
28. A process as claimed in claim 27, wherein a voltage in the range of from 100 V to 60 kV is applied.
- 20 29. A process as claimed in claim 27 or claim 28, wherein a voltage in the range of from 100 V to 30 kV is applied.
30. A process as claimed in any one of claims 27 to 29, wherein a voltage in the range of from 100 V to 10 kV is applied.
- 25 31. A process as claimed in any one of claims 1 to 30, wherein a substrate comprising a non-metal is immersed.

32. A process as claimed in any one of claims 1 to 31, wherein the substrate is immersed with the fluidising chamber in a charged condition for a period of up to 30 minutes, 20 minutes, 10 minutes, 5 minutes or 3 minutes.
- 5 33. A process as claimed in any one of claims 1 to 32, wherein the substrate is immersed with the fluidising chamber in a charged condition for a period of at least 10 milliseconds, 500 milliseconds or 1 second.
- 10 34. A process as claimed in any one of claims 1 to 33, wherein a coating of thickness of up to 500 microns, or up to 200, 150, 100 or 80 microns is applied.
- 15 35. A process as claimed in any one of claims 1 to 34, wherein a coating of thickness of at least 5 microns, or at least 10, 20, 50, 60 or 80 microns is applied
36. A process as claimed in claim 35, wherein a coating of thickness in the range of from 20 to 50 microns, 25 to 45 microns or 50 to 60 microns is applied.
- 20 37. A process as claimed in any one of claims 1 to 36, including shaking or vibrating the substrate to remove loose particles.
38. A process as claimed in any one of claims 1 to 37, wherein the powder coating composition is a thermosetting system.
- 25 39. A process as claimed in claim 38, wherein the film-forming polymer in the or each powder coating component of the powder coating composition is one or more selected from carboxy-functional polyester resins, hydroxy-functional polyester resins, epoxy resins and functional acrylic resins.

40. A process as claimed in any one of claims 1 to 37, wherein the powder coating composition is a thermoplastic system.
- 5 41. A process as claimed in any one of claims 1 to 40, wherein the powder coating composition incorporates, by post-blending, one or more fluidity-assisting additives.
- 10 42. A process as claimed in claim 41, wherein the powder coating composition incorporates a combination of alumina and aluminium hydroxide as a fluidity-assisting additive.
43. A process as claimed in claim 42, wherein the fluidity-assisting additive includes hydrophobic silica.
- 15 44. A process as claimed in claim 42, wherein the fluidity-assisting additive includes a PTFE modified wax.
- 20 45. A process as claimed in any one of claims 1 to 44, wherein substantially all of the powder particles are no larger than 10 μm .
46. A process as claimed in any one of claims 1 to 45, wherein the powder coating composition is a low-bake composition.
- 25 47. A process as claimed in any one of claims 1 to 46, wherein the substrate is wholly immersed within the fluidised bed.
48. A coated substrate obtained by a process as claimed in any one of claims 1 to 47.